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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/586,369
Filing Date: July 18, 2006
Appellant(s): BOHMHAMMEL ET AL.

Stephan U. Koschmieder
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 21, 2011 appealing from the Office action mailed July 23, 2010.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application:
Claims 1-17, 19-23, and 26-33.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

WITHDRAWN REJECTIONS

The following grounds of rejection are not presented for review on appeal because they have been withdrawn by the examiner.

The rejection of claims 27-28 under 35 U.S.C. 112, first paragraph.

For the 102 and 103 rejections over Yamanaka et al (6,653,212), the reference DeLuca (5,910,295) is withdrawn. Since the rejections rely on either DeLuca '295 or Rodgers (3,933,985) to show inherent state of fact, dropping DeLuca '295 is not considered as a new ground of rejection.

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

3,933,985

Rodgers

01-1976

5,716,590	Roewer et al	02-1998
6,653,212	Yamanaka et al	11-2003
JP 57-118,017	Mitsutoshi	07-1982

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-17, 19-23, 26-30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, step (b) further requires "passing the product mixture from the heating as a starting material to a direct further use", this step would use the trichlorosilane (HSiCl_3) produced in the heating step to produce other products, such as alkoxysilanes, organochlorosilanes, monosilane or silicon or silica (note for example, the instant specification, page 6, lines 5-9). Thus, when step b) is positively required, this step does not further limit the "process for the catalytic hydrodehalogenation of SiCl_4 to HSiCl_3 " because the final product, after step b), would no longer be the HSiCl_3 .

Claims 1-3, 5, 14-15, 17, 21-22, 27, 29-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamanaka et al (6,653,212) with Rodgers et al (3,933,985) to show inherent state of fact.

Yamanaka '212 discloses a process for forming a thin film on a substrate in a vacuum chamber by catalytic CVD or high density plasma CVD or high density catalytic CVD, comprising:

a cleaning step of feed a carrier gas containing hydrogen to the vacuum chamber and cleaning the top of the substrate by activated hydrogen H^+ generated in the fed carrier gas, and

a thin film forming step of forming the thin film on the substrate by feeding a material gas to the vacuum chamber (note claim 30).

The substrate can be silicon (note claim 61).

The thermal catalyst contains at least one type of material selected from a group consisting of tungsten, tungsten containing thoria, platinum, molybdenum, palladium, tantalum, etc. (note claim 49). The thermal catalyst is heated to 800-1700°C (note column 33, lines 14-16). The thermal catalyst can be a coil or other shapes such as wire, grid (note paragraph bridging columns 43-44).

The thin film can be a polycrystalline silicon, single crystalline silicon, amorphous silicon, microcrystalline silicon, etc. (note claim 56). The polycrystalline silicon and single crystalline silicon film are formed by a gas containing hydrogen as the carrier gas and containing at least one of monosilane, disilane and trisilane as the material gas (note claim 59). Yamanaka '212 further teaches that beside the material gas as stated above, silicon tetrachloride can be used (note column 48, lines 53-54). Thus, Yamanaka '212 fairly teaches, with sufficient specificity, a process for producing polycrystalline silicon and single

crystalline silicon film by using hydrogen as the carrier gas and tetrachloride as the material gas.

Yamanaka '212 teaches that catalytic CVD is a method for activating and ionizing at least one part of a material by a catalytic reaction or a thermal decomposition reaction for the thermal catalyst heated to less than the melting and depositing these deposition seeds on a heated substrate (note column 9, lines 12-16). The thin film is formed on the surface of the substrate by utilizing a thermal decomposition reaction and/or catalytic reaction by the thermal catalyst (note column 26, lines 9-12). When monosilane is used as the material gas, thin film is deposited by catalytic decomposition (note column 42, lines 22-26); however, the teaching of Yamanaka '212 is not limited to just the decomposition of monosilane because Yamanaka '212 also teaches that the formation of silicon thin film can be carried out by "catalytic reaction". When there is a "reaction", the material gas must have been reacted with another reactant. When other material gas is used, such as silicon tetrachloride, and in the presence of hydrogen, the silicon thin film would be deposited by a catalytic *reaction* as evidenced by Rodgers '985 (note reactions 1 and 2 in column 3 and Example 1), i.e. the silicon tetrachloride would react with hydrogen to first form trichlorosilane (faster reaction) before the trichlorosilane would further react with hydrogen to form silicon and HCl, hydrogen, and silicon tetrachloride with unreacted trichlorosilane (note reaction in column 1, lines 36-40).

In any event, the process of Yamanaka '212 has all the positive process steps as required in the instant claims, i.e. bringing a gaseous feed mixture comprising hydrogen and silicon tetrachloride into direct contact with a heating element and heating the gaseous

feed mixture by contacting the gaseous feed mixture with the heating element, at least some HSiCl_3 would inherently be formed as an intermediate product. This intermediate product would further be used to form the silicon film, as required in step (b) of the instant claim 1, as disclosed in Yamanaka '212. Again, Rodgers '985 can be used to show the inherent state of fact that HSiCl_3 reacts with hydrogen to form Si.

It should be noted that in Yamanaka '212, as carrier gas, "preferably use is made of an inert gas such as He, H_2 , Ar, or N_2 " (note column 48, lines 53-54), the "inert gas" is preferred but not a must.

Yamanaka '212 further teaches that by feeding hydrogen as the carrier gas, heating the thermal catalyst to a state enabling a catalytic action, and continuously forming at least the silicon film and the gate insulating film, a slow stress and low contamination can be achieved in the gate channel portion (note column 13, lines 20-24).

The process of Yamanaka '212 anticipates the claimed process.

Claims 1-11, 13-17, 19-23, 29-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamanaka '212 with Rodgers '985 to show inherent state of fact.

Yamanaka '212 discloses a process as stated above. Rodgers '985 can be applied to teach that trichlorosilane is inherently formed as an intermediate product in the process of Yamanaka '212.

In the event the number of embodiments in Yamanaka '212 is too large for anticipation, it would have been obvious for one of ordinary skill to select any combinations among the embodiments disclosed in Yamanaka '212.

Yamanaka '212 discloses that the substrate temperature can be about 300-400°C or about 800-1000°C (note column 51, lines 9-13 and lines 21-22) and the thermal catalyst is heated to 800-1700°C (note column 33, lines 14-16). These three ranges fairly suggest that the gaseous feed mixture is contact with the heating element at a temperature in any of these three ranges.

For overlapping ranges, with respect to the encompassing and overlapping ranges previously discussed, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time of invention to select the portion of the prior art's range which is within the range of the applicants' claims because it has been held prima facie case of obviousness to select a value in a known range by optimization for the results. *In re Boesch*, 205 USPQ 215. Additionally, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness. *In re Malagari*, 182 USPQ 549.

Yamanaka '212 discloses that the power supply in the example is a DC power supply or an AC power supply or a power supply wherein the AC is superposed on the DC and is selected in accordance with the situation. By adjusting the voltage and/or current of the power supply, it becomes possible to adjust the temperature of the thermal catalyst (note column 45, lines 1-10) and it would have been obvious to one skilled in the art to optimize the temperature of the thermal catalyst to provide the best results.

In the process of Yamanaka '212, it would have been obvious to one of ordinary skill in the art to optimize the space velocity, the molar ratio of hydrogen and silicon tetrachloride, the pressure for the process in order to obtain the best results.

For the construction material for the reactor of Yamanaka '212, it would have been within the skill of the artisan to select a construction material for the reactor that can withstand the reaction conditions.

For claim 32, the "gaseous mixture consisting of hydrogen and silicon tetrachloride" does not exclude the presence of a solid substrate in the process of Yamanaka '212. For the step of forming polycrystalline silicon film, only hydrogen and a silicon containing gas are used, in this instant, monosilane is used (note for example, column 52, lines 20-35). It should be noted that SiCl_4 can be used instead of monosilane (note column 48, lines 53-54).

For claim 27, as evidenced by Rodgers '985, silicon tetrachloride would react with hydrogen to form trichlorosilane and HCl first because this is a fast reaction (note column 3, lines 10-27) and then the trichlorosilane would be converted to Si (note column 1, lines 34-40).

Claims 1-17, 19-23, 26-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 57-118017 in view of Yamanaka et al (6,653,212) and Roewer et al (5,716,590), further in view of Rodgers (3,933,985).

JP '017 discloses a process for producing SiHCl_3 in high yield. In the process, SiCl_4 is mixed with H_2 in 4:1 to 1:10 molar ratio and introduced into the first reactor B, and by electrifying a graphite resistance 1, the interior of the reactor B is heated to 500-1,300°C to

produce SiHCl_3 as well as HCl by-product in the presence of catalyst 9 (note English abstract). In JP '017, any unreacted reactants can be transferred to the second reactor to further produce SiHCl_3 and this step can be deleted along with its function. In re Wilson 153 USPQ 740 (CCPA 1967).

The SiCl_4 to H_2 ratio as disclosed in JP '017 overlaps the claimed range. With respect to the encompassing and overlapping ranges previously discussed, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time of invention to select the portion of the prior art's range which is within the range of the applicants' claims because it has been held prima facie case of obviousness to select a value in a known range by optimization for the results. *In re Boesch*, 205 USPQ 215. Additionally, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness. *In re Malagari*, 182 USPQ 549.

For the pressure, space velocity for the reaction, it would have been obvious to one of ordinary skill in the art to optimize these conditions through routine experimentation in order to obtain the best results.

For the construction material for the reactor of JP '017, it would have been within the skill of the artisan to select a construction material for the reactor that can withstand the reaction conditions.

The process of JP '017 is a catalytic hydrodehalogenation of SiCl_4 as required in the instant claims because the process of JP '017 uses a catalyst (note English abstract and

catalyst "9" in Figure 3) and because SiCl_4 reacts with hydrogen to form SiHCl_3 (gains one hydrogen and loses one chlorine). The reactants in JP '017 are in direct contact with the heating element (note Figure 3, heating element "1").

The differences are JP '017 does not disclose (1) the use of a metal heating element (the heating element in JP '017 is a graphite resistance) and (2) the fractionating or at least condensing the product mixture (step (a)) or passing the product stream to a direct further use (step (b)).

For difference (1), Yamanaka '212 discloses a thin film forming apparatus comprising a vacuum chamber, a substrate, a thermal catalyst, and a heating means for heating the thermal catalyst, wherein a gas introduction system for introducing a gas is connected to the vacuum chamber and wherein the gas is fed from the gas introduction system into the vacuum chamber to form a thin film on a surface of the substrate by utilizing a thermal decomposition reaction and a catalytic reaction by the thermal catalyst, the gas introduction system introduces a carrier gas containing hydrogen and a material gas for forming the thin film on the substrate, and the apparatus comprises a means for raising a concentration of the material gas in the vacuum chamber in the middle of the formation of the thin film on the substrate (note claim 1).

The thermal catalyst is preferred to be a wire made of tungsten, palladium, tantalum or molybdenum (note column 32, lines 63-65). The thermal catalyst 5 is not limited to one formed into a coil as shown in Figures 1-3. It is also possible to form it into a grid as shown in FIG. 6. The grid-like thermal catalyst is formed by for example assembling a plurality of wires having predetermined lengths in a grid and joining assembly portions of

the wires by welding or the like. Further, it is also possible to form the thermal catalyst by winding a wire, coil, or the like of the thermal catalyst one or more times around a high heat resistant insulator such as ceramics, and quartz glass. Alternatively, it is also possible to press it to a flat metal plate to form the grid (note paragraph bridging column 43-44). The power supply in the present example is a DC power supply or an AC power supply or a power supply wherein the AC is superposed on the DC and is selected in accordance with the situation. By adjusting the voltage and/or current of the power supply, it becomes possible to adjust the temperature of the thermal catalysts (note column 45, lines 1-10).

Yamanaka '212 also discloses that the apparatus can be used to produce a film of Si and Poly-Si, produced from SiH_4 , SiHCl_3 , SiCl_4 , etc. (note column 48, lines 52-54).

Thus, Yamanaka '212 fairly teaches that the thermal catalyst can be safely used in an atmosphere containing SiCl_4 , SiHCl_3 and H_2 .

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace with graphite heating element in the process of JP '017 with the metal heating element as suggested by Yamanaka '212 to achieve a predictable result, i.e. heating up the reactants to the reaction temperature.

It should be noted that there is no comparative example in the instant specification to show any unexpected results when using the claimed metal heating element as compared to the graphite heating element in JP '017. It should also be noted that the instant claims do not exclude the presence of a catalyst (as disclosed in JP '017) nor require the metal heating element to serve as the catalyst.

In any event, Roewer '590 discloses a process for catalytic hydrodehalogenation of a halogen containing compound of carbon or silicon by contacting said compound in the presence of hydrogen with a catalytically active material comprising (1) elemental silicon and at least one transition metal or comprising (2) a transition metal silicide, at a temperature sufficient to induce catalytic hydrodehalogenation (note claim 1). The transition metal is preferred to be nickel, copper, iron, cobalt, molybdenum, palladium, platinum, etc. (note column 5, lines 23-37). Roewer '590 discloses a process for producing trichlorosilane (SiHCl_3) from silicon tetrachloride (SiCl_4) using the catalyst as mentioned above in Example 4.

It would have been obvious to one of ordinary skill in the art to use the catalytically active material as suggested by Roewer '590 as the catalyst in the process of JP '017 to obtain a predictable result because such catalytically active material is analogous to the catalyst used in JP '017.

For the combined teaching of JP '017, Roewer '590 and Yamanaka '212, it should be noted that in Yamanaka '212, the thermal catalyst contains at least one type of material selected from a group consisting of tungsten, tungsten containing thoria, platinum, molybdenum, palladium, tantalum, metal deposited ceramics, silicon, alumina, silicon carbide, refractory metals (tungsten, tantalum, tungsten containing thoria, molybdenum, titanium, etc.) coated with silicon carbide or ceramics or conductive nitride films, silicon nitride or oxide, conductive metal nitrides (tungsten nitride, titanium nitride, molybdenum nitride, tantalum nitride, etc.), boronitride (BN), and silicide (note claim 24). The "at least one" fairly suggests a combination of two or more of the above listed compounds can be

used, such as a combination of silicon and a metal, and this combination is the similar to the catalytically active material disclosed in Roewer '590.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the thermal catalyst, as suggest by Yamanaka '212, which comprises a silicide or a mixture of silicon and a metal, for heating the reactor in the process of JP '017 because such thermal catalyst can serve as both the heating element and the catalytically active material, as suggested by Roewer '590.

Rodgers '985 can be applied to teach that when SiCl_4 is used to produce Si (as desired in the process of Yamanaka '212), the reaction between SiCl_4 and hydrogen is too slow, so the SiCl_4 normally reacts with hydrogen to form SiHCl_3 first then the SiHCl_3 is subsequently converted to Si.

Thus, Rodgers '985 fairly suggests that when SiCl_4 is used as the starting reactant in Yamanaka '212, the thermal catalyst in Yamanaka '212 may serve as a catalyst to promote the formation of SiHCl_3 from SiCl_4 first, before the SiHCl_3 is converted to Si film.

For difference (2), when (a) is positively required, JP '017 discloses that in the second reactor, the mixed gas containing the residual unreacted SiCl_4 and H_2 is cooled and passed through a fixed metallic Si bed; the HCl is converted into SiHCl_3 by a reaction with the metallic Si. As shown in Figure 1, it is known in the art to separate the product mixture, obtained after reacting SiCl_4 and hydrogen, to recover the SiHCl_3 product (note box "C", "D"). Also, as shown in Figure 2, according the preferred embodiment of JP '017, when the product mixture from reactor B is further reacted in reactor I to convert HCl into SiHCl_3 , the resulting mixed gas of H_2 , SiCl_4 and SiHCl_3 is taken out of the exhaust port 7,

and the SiHCl_3 is separated and collected (note English abstract). The extra step of the converting HCl into the SiHCl_3 is not excluded by the "comprises" language. In any event, this extra step can be deleted along with its attended function.

JP '017 does not specifically disclose how the SiHCl_3 is separated.

Rodgers '985 discloses that after a mixture of hydrogen and silicon tetrachloride is passed through a furnace reactor unit at suitable rates and temperatures to convert a portion of the silicon tetrachloride to trichlorosilane, the reaction products from the furnace are passed through a pre-cooler to lower the temperature of the products to approximately room temperature and the room temperature gases are then passed through a condenser unit to separate the hydrogen and hydrochloric acid reaction products from the silicon tetrachloride and chlorosilane liquid products. The hydrogen gas and the hydrochloric acid gaseous products are directed through a water scrubber which separates the hydrochloric acid from the hydrogen and the hydrogen gas after suitable drying can be reused as the hydrogen source. The liquid mixture of silicon tetrachloride and trichlorosilane is passed through a distilling unit which separates the trichlorosilane product from the silicon tetrachloride which later can be recycled (note paragraph bridging columns 2-3).

For the combined teaching of JP '017 and Rodgers '985, it would have been obvious to one skilled in the art to separate the product gas obtained from the first reactor (reactor "B" in Figure 3) or the mixed gas obtained from the second reactor (reactor "1" in Figure 3) into the product stream SiHCl_3 , the unreacted SiCl_4 stream, and the H_2 and by-product HCl stream as suggested by Rodgers '095 (note Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to separate the hydrogen from the silicon tetrachloride and the trichlorosilane in the process of JP '017 by condensing method and to separate the silicon tetrachloride from the trichlorosilane by distilling method (which is considered the same as the claimed "fractionating") as suggested by Rodgers '985 in order to recover hydrogen and silicon tetrachloride for recycling purposes.

When limitation (b) is positively required in the instant claim 1, Rodgers '985 is also applied to teach that after the SiHCl_3 is formed, the SiHCl_3 is fed to a subsequent step to produce Si (note column 1, lines 34-40 and Figures 1-2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the SiHCl_3 produced in the process of JP '017 as the reactant to produce Si as suggested by Rodgers '985 because using a product from one reaction as reactant for another reaction is well within the skill of the artisan.

(10) Response to Argument

(I) The rejection of claims 27-28 under 35 U.S.C. 112, first paragraph.

This rejection has been withdrawn.

(II) The rejection of the claims under 35 U.S.C. 112, second paragraph.

Appellants argue that with regard to the question of definiteness it is immaterial whether the claimed process may include optional steps.

As stated in the above rejection, when (b) is positively required, the HSiCl_3 produced in the heating step (note Appellants' claim 1) is passed "as a starting material to a direct further use". This limitation is regarded as relating to a process of using the HSiCl_3 , which is distinct and different than the claimed process of making the HSiCl_3 . Also, when HSiCl_3 is used as starting material in a direct further use, the HSiCl_3 would be consumed and the final product of Appellants' claim 1 would no longer be HSiCl_3 as required in the preamble of the claim. In the instant case, when step (b) is positively recited, it conflicts with the preamble of the pending claims.

(IIIa) The rejection of the claims as anticipated by Yamanaka (6,653,212)

Appellants argue that Yamanaka explicitly discloses that hydrogen is an inert gas "for the formation of a film of Si and Poly-Si".

In Yamanaka '212, the catalytic CVD method as disclosed can be either or "catalytic reaction" or a "thermal decomposition" (note for example, column 9, lines 12-16 and column 16, lines 9-13); thus, carrier gas can be an inert for "thermal decomposition" and can be a reactant for "catalytic reaction". It should be noted that the use of "inert gas" as mentioned in column 48, lines 48-52) is only preferred, not mandatory. Furthermore, it should be noted that "carrier" gas can be different from "inert" gas, i.e. carrier gas can be used in addition to inert gas (note for example, column 25, lines 15-18 and claim 108). Since the hydrogen used in Yamanaka is the same the hydrogen used in the claimed invention, it would inherently react with the silicon tetrachloride at high temperature, just as required in the claimed process.

Appellants argue that Yamanaka does not disclose that hydrogen is preferably inert and instead describes a preferable group of inert gases.

Again, Yamanaka '212 discloses that "as the carrier gas, preferably use is made of an inert gas", which means an inert gas is preferred to be used as the carrier gas, but it is not mandatory to do so.

(IIIb) The rejection of the claims as anticipated by Yamanaka (6,653,212)

DeLuca reference is withdrawn from the rejection to simplify issue.

Appellants argue that Yamanaka describes a process in which the deposition of silicon is the goal, the Rodgers reference describes a process in which the deposition and formation of silicon is avoided.

Granted that it is true, however, Rodgers discloses a 2-step process, in the first step, trichlorosilane is produced and the formation of silicon is avoided in this step as argued by Appellants; however, in the second step, the trichlorosilane is converted into silicon (note Figure 2). Rodgers '985 fairly teaches that reaction (2) is a faster reaction so that at least some SiHCl_3 would be formed in the process of Yamanaka '212 until there is sufficient amount of Si deposited to favor the reaction (1).

Appellants argue that claims 27 and 29 are not anticipated by Yamanaka.

As evidenced by Rodgers '985, reaction (2) (note column 3) is a faster reaction, so that at least some SiHCl_3 would be formed along with HCl in the process of Yamanaka '212.

Appellants argue that in claim 29, a product mixture formed by hydrodehalogenation "consists of HSiCl_3 formed by catalytically dehydrogenating" silicon tetrachloride. Yamanaka cannot anticipate claim 29 because the Yamanaka process necessarily form silicon in the form of the thin-film.

The above argument is not persuasive because in Appellants' independent 1, the product mixture is as a starting material to a direct further use, such as to form silicon thin film as disclosed in Yamanaka '212.

(IV) The rejection of claims 1-11, 13-17, 19-23, 27 and 29-33 as obvious over Yamanaka '212 with Rodgers.

Appellants argue that Yamanaka does not explicitly, implicitly or inherently describe a process in which silicon tetrachloride is hydrodehalogenated with hydrogen to form silicon trichloride.

This argument is not persuasive for the same reasons as stated above.

Appellants argue that claim 7 recites a minimum of 2000 reactor volumes of feed gas mixture per hour and the process of Yamanaka is carried out in a vacuum chamber and nothing in Yamanaka reference is suggestive to the space velocities recited in claim 7.

In Yamanaka '212, it is possible to control the introduction of the material gas by the material gas controlling means so that the second material gas is introduced at substantially the same time as the discharge of the first material gas from the vacuum chamber. In this way, by continuously introducing the material gas, the thin film layer can be obtained in a shorter time and thus it becomes possible to achieve an improvement of

the work efficiency (note column 3, lines 44-51). Thus, it would have been obvious to one skilled in the art to optimize the introduction of the material gas, including the rate, in order to shorten the reaction time.

Appellants argue that for Appellants' claims 19-20, Yamanaka '212 only describes a process which is carried out under vacuum conditions.

Granted that Yamanaka '212 discloses vacuum conditions, however, it would have been obvious to one skilled to carry out the CVD process as disclosed Yamanaka '212 under atmospheric pressure or other pressure, depending on the desired properties of the final product.

Appellants argue that claim 12 requires an isolating step that is not suggested by Yamanaka.

Claim 12 is not included in this ground of rejection.

(V) The rejection of claims as obvious over JP '017.

Appellants argue that JP '017 discloses a graphite heating element and Yamanaka '212 discloses a metal heating element and graphite and metal are different.

Both the graphite heating element in JP '017 and the metal heating element in Yamanaka '212 are connected to an electric power source (note JP '017, abstract, "electrifying a graphite resistance"; note Yamanaka '212, Figure 1, metal heating element "5" is connected to power source "5a" which can be direct current or alternate current, note paragraph bridging columns 32-33) to heat up the reactants. Thus, it would have been obvious to one skilled in the art to replace the graphite heating element in JP '017

with the metal heating element as suggested by Yamanaka '212 to achieve the predictable result.

Appellants argue that Rower reference does not describe the use of heating element but instead describes heating a reaction mixture that includes a halogen-containing in the presence of a finely-dispersed material that may contain a transition metal.

Rower '590 is not relied upon to teach the heating element. Rower '590 is applied to suggest the use of a transition metal as the catalyst for the process of producing trichlorosilane from silicon tetrachloride.

Appellants argue that for claim 33, the catalytically active material of Roewer '590 is not in metallic form but is instead a combination of silicon and the metal, e.g., in the form of a metal silicide.

It should be noted that Roewer '590 teaches that the catalytically active material can be (1) element silicon and at least one transition metal (i.e., in metallic form) or (2) a transition metal silicide, not just a metal silicide as argued by Appellants.

Appellants argue that the particular form of material in Appellants' claims 3 and 4 are not suggested by Roewer '590.

Roewer '590 is not relied upon to teach the heating element. As stated in the above rejection, for the combined teaching of JP '017, Yamanaka '212 and Roewer '590, it would have been obvious to one of ordinary skill in the art to use the metal heating element as suggested by Yamanaka '212 for the process of JP '017 because it can serve not only as a heating element to replace to the graphite heating element in JP '017 but also as catalyst,

as suggested by Roewer '590. Again, any element silicon that is used as part of the catalytically active material (1) as suggested by Roewer '590 would not be excluded by the "consisting of" for the "gaseous mixture of hydrogen and silicon tetrachloride".

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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